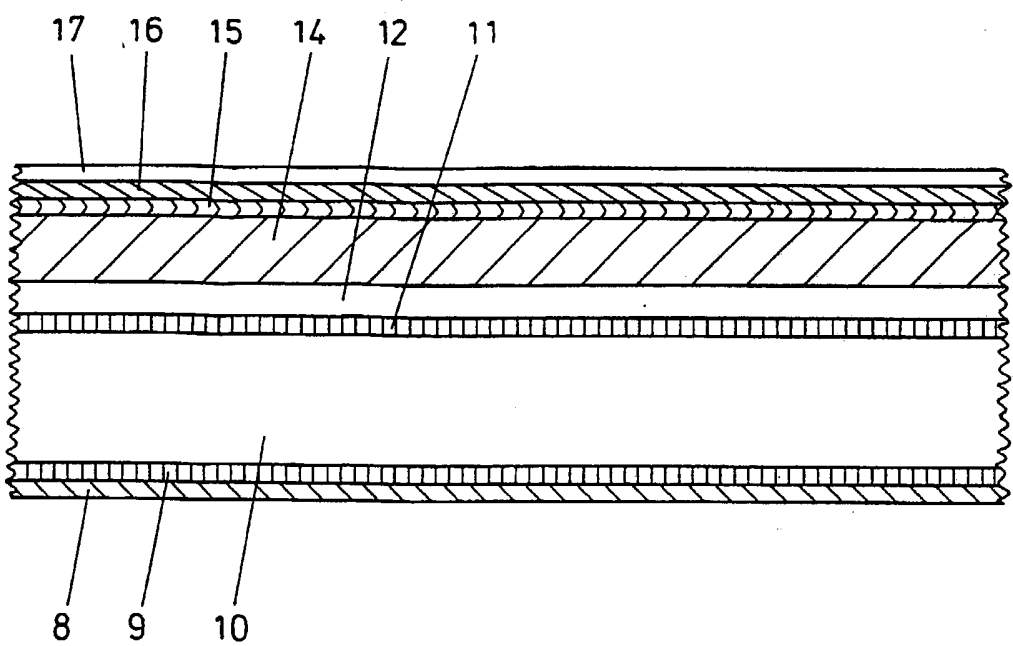




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(21) International Application Number: PCT/GB92/01919 (22) International Filing Date: 19 October 1992 (19.10.92) (30) Priority data: 9122028.5 17 October 1991 (17.10.91) GB (71) Applicant (for all designated States except US): APPLIED HOLOGRAPHICS PLC [GB/GB]; 22 Sedling Road, Wear District 6, Washington, Tyne and Wear NE38 9BZ (GB). (72) Inventors; and (75) Inventors/Applicants (for US only) : SHEARER, James, Alexander [GB/GB]; Old House, Old House Road, Great Horksley, Colchester, Essex CO6 4EQ (GB). WOOD, David [GB/GB]; 11 Northlands, Tynemouth, Tyne and Wear NE30 2TL (GB).		(74) Agent: GIBSON, Stewart, Harry; Urquhart-Dykes & Lord, Business Technology Centre, Senghennydd Road, Cardiff CF2 4AY (GB). (81) Designated States: CA, GB, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: PACKAGING MATERIAL WITH HOLOGRAPHIC PATTERN  (57) Abstract <p>A flexible sheet material used for packaging foodstuff comprises a substrate (10) carrying a thermoplastic layer (14) which is formed over its outer surface with an embossed holographic relief pattern. Printing may be applied over the thermoplastic layer (14).</p>		

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PACKAGING MATERIAL WITH HOLOGRAPHIC PATTERN.

This invention relates to a flexible sheet material for use in packaging food products, particularly dry food products such as crisps, biscuits, nuts and cereals for example.

This invention particularly relates to sheet packaging material which incorporates holograms for decorative purposes.

Sheet packaging material for food packaging is conventionally supplied in roll form, in widths typically between 650 mm and 1200 mm. These are considerably wider than conventional techniques allow for the production of sheet material embossed with holograms: for this purpose, a thermoplastic substrate is heated, impressed with an embossed platen and then cooled; but in order to ensure that an embossed relief pattern of the required uniform high quality is formed across the full width of the sheet material web, this web has been limited in width (typically to 200 mm).

In accordance with this invention, there is provided a method of forming a flexible sheet material, comprising forming a thermoplastic layer over a substrate, then forming a holographic embossed relief pattern in the surface of the thermoplastic layer.

We have found that with the thermoplastic layer carried by a substrate, it is possible to achieve a uniform high quality relief pattern across webs of substantial width, e.g. up to 1200 mm.

The thermoplastic layer may comprise an acrylic or a polyurethane. When heated, the thermoplastic layer softens and can then be embossed under light pressure from an embossing platen.

The thermoplastic layer may be applied to the substrate in the form of an aqueous-based or solvent-based emulsion or lacquer and then dried. If solvent-based, solvent is selected which is free of any toluene or methylethylketone, and which has a very low vapour pressure so that most, if not all, of the solvent is driven off during the drying of this layer. One suitable solvent is ethylacetate.

Printing may be applied to the embossed surface of the thermoplastic layer, preferably after a metal (e.g. aluminium) film has been applied e.g. by vapour deposition or sputtering.

The printing is preferably protected by a layer of varnish.

Alternatively, a separate sheet material may be laminated to the embossed thermoplastic layer, this separate sheet comprising a transparent substrate having printing
5 applied to its undersurface.

Also in accordance with this invention, there is provided a flexible sheet material which comprises a substrate carrying a thermoplastic layer which is formed over its outer surface with an embossed holographic relief pattern.

10 Further in accordance with this invention, there is provided a package formed of the above-defined flexible sheet material and containing foodstuff.

Embodiments of this invention will now be described by way of examples only and with reference to the accompanying
15 drawings, in which:

FIGURE 1 is an enlarged diagrammatic section (not to scale) through a first embodiment of flexible sheet packaging material in accordance with this invention;

FIGURE 2 is a similar diagrammatic section through a
20 second embodiment of flexible sheet packaging material in accordance with this invention;

FIGURE 3 is a similar diagrammatic section through a third embodiment of flexible sheet packaging material in accordance with this invention; and

25 FIGURE 4 is a similar diagrammatic section through a fourth embodiment of flexible sheet packaging material in accordance with this invention.

Referring to Figure 1 of the drawings, there is shown a first embodiment of flexible sheet packaging material in
30 accordance with this invention, the sheet material comprising a plastics film substrate 10 carrying a thermoplastics layer 14 which is embossed with holograms at intervals across its surface. The construction includes other layers which will be apparent from a description given below of the manner in which
35 the flexible sheet packaging material is made.

Firstly, the film 10 is provided in sheet or preferably roll form, comprising polypropylene of typically 30 to 40 microns thickness. The film 10 is subjected to a corona discharge treatment over both of its surfaces, as indicated at

9 and 11. Next a keying or priming coating 12 is applied, e.g. of polyurethane. Then the thermoplastic layer 14 is applied, in the form of an aqueous-based acrylic emulsion which is then dried. The sheet material so far prepared (comprising layers 5 10, 12 and 14) is then passed lengthwise through an embossing apparatus, in which it is warmed to soften the thermoplastic layer 14, then impressed by a holographic master to form holograms embossed in relief in the surface of the layer 14, and then cooled to preserve the embossed relief pattern. This 10 embossed relief pattern is indicated at 15.

Next a film 16 of metal (typically aluminium) is deposited over the embossed thermoplastic layer 14, either by vacuum deposition or by sputtering. Then printing is applied to the sheet material over the film 16, and covered by a thin 15 film of varnish, indicated at 17. The opposite surface of the sheet material is coated with a conventional cold seal layer 8.

The embodiment shown in Figure 2 comprises a polypropylene film substrate 20 of typically 18 to 24 microns 20 thickness, with heat seal layers 19,21 co-extruded with the substrate over its opposite surfaces. One surface is then subjected to a corona discharge treatment, as indicated at 22, then the thermoplastic layer 24 is applied, in the form of a solvent-based polyurethane. Once this is dried, the layer 24 25 is formed with an embossed relief pattern 25, as described with reference to Figure 1 and given an aluminium film 26. The sheet material may then be printed over the film 26 and coated with varnish, also as described with reference to Figure 1. Alternatively however, the sheet material so far described may 30 be laminated to a separate material which comprises a transparent polypropylene layer 20a having a heat seal layer 21a over one surface and a priming coating 22a on its other surface: printing is applied over the coating 22a and then this surface is coated with adhesive 23a for bonding to the 35 aluminium film 26. The printing may instead be applied to the film 26 before the bonding takes place. The printing is visible through the transparent layer 20a and the holograms are visible through this layer, through the printing (or through non-printed areas between printed areas) and through the

aluminium film 26.

The embodiment shown in Figure 3 comprises a polypropylene film substrate 30 of typically 30 to 40 microns thickness with an acrylic heat seal layer 32 over one surface
5 and an acrylic thermoplastic layer 34 over the other surface.

An embossed relief pattern, indicated at 35, is formed in the layer 34 in the manner previously described, and then the aluminium film 36 is applied. The sheet material is then printed over the film 36 and coated with varnish, also as
10 previously described.

The embodiment shown in Figure 4 comprises a polypropylene film substrate 40 coated over one surface with a pvdc heat seal layer 41 and over the other surface with an acrylic primer 42 to which an acrylic solvent-based
15 thermoplastic layer 44 is applied.

The layer 44 is embossed at 45 and then receives an aluminium film 46 as previously described: as described with reference to Figure 2, the material may then be printed and coated with varnish, or laminated to the separate material
20 consisting of layers 20a to 23a. In the former case the polypropylene substrate 40 has a thickness of 30 to 40 microns, whilst in the latter case the polypropylene substrates 40 and 20a each has a thickness of 18 to 24 microns.

The packaging materials which have been described
25 provide an effective moisture and vapour barrier and is therefore for packaging foodstuffs, such as those mentioned previously herein. In forming a package, the sheet material may be folded to bring one side into contact with itself, or with the opposite side, and the contacting areas are sealed by
30 the application of heat and pressure (if the contacting layers comprise heat seal layers) or pressure alone (if the contacting layers comprise cold seal layers). In any event the package is formed with the embossed surface of the thermoplastic layer facing outwardly.

35 As previously described, the thermoplastic layer of each embodiment is applied to the substrate in the form of an aqueous-based or solvent-based emulsion and then dried. If solvent-based, a solvent is selected which is free of toluene or methylethylketone, or at least such that after drying the

thermoplastic layer contains no more than 10mg per square metre of retained toluene or methylethylketone.

CLAIMS

- (1) A method of forming a flexible sheet material, comprising forming a thermoplastic layer over a substrate, then forming a holographic embossed relief pattern in the surface
5 of the thermoplastic layer.
- (2) A method as claimed in claim 1, in which the thermoplastic layer comprises an acrylic or a polyurethane.
- (3) A method as claimed in claim 1 or 2, in which the thermoplastic layer is applied to the substrate in the form of
10 an aqueous-based or solvent-based emulsion, and then dried.
- (4) A method as claimed in claim 3, in which the solvent is free of toluene and methylethylketone.
- (5) A method as claimed in claim 4, in which the solvent comprises ethylacetate.
- 15 (6) A method as claimed in any preceding claim, in which printing is applied over the embossed surface of the thermoplastic layer.
- (7) A method as claimed in any one of claims 1 to 5, in which a transparent sheet is bonded over the thermoplastic
20 layer, printing being applied to the underside of the transparent sheet or to the embossed surface of the thermoplastic layer.
- (8) A flexible sheet material which comprises a substrate carrying a thermoplastic layer which is formed over its outer
25 surface with an embossed holographic relief pattern.
- (9) A flexible sheet material as claimed in claim 1, comprising a transparent sheet bonded over the thermoplastic layer, printing being applied to the underside of the transparent sheet or to the embossed surface of the
30 thermoplastic layer.

(10) A package formed of flexible sheet material as claimed in claim 8 or 9.

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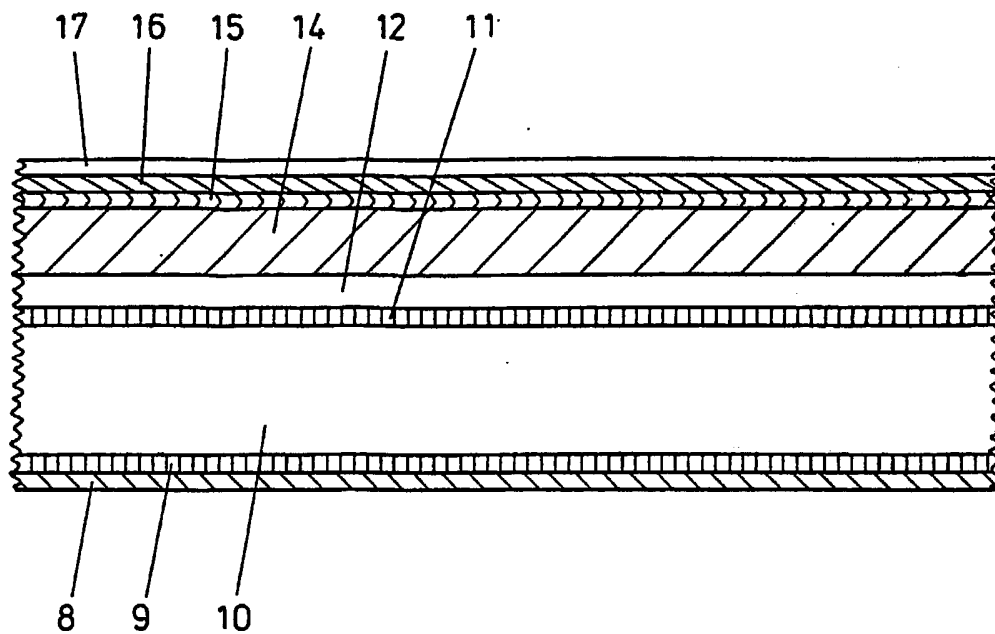


FIG. 1

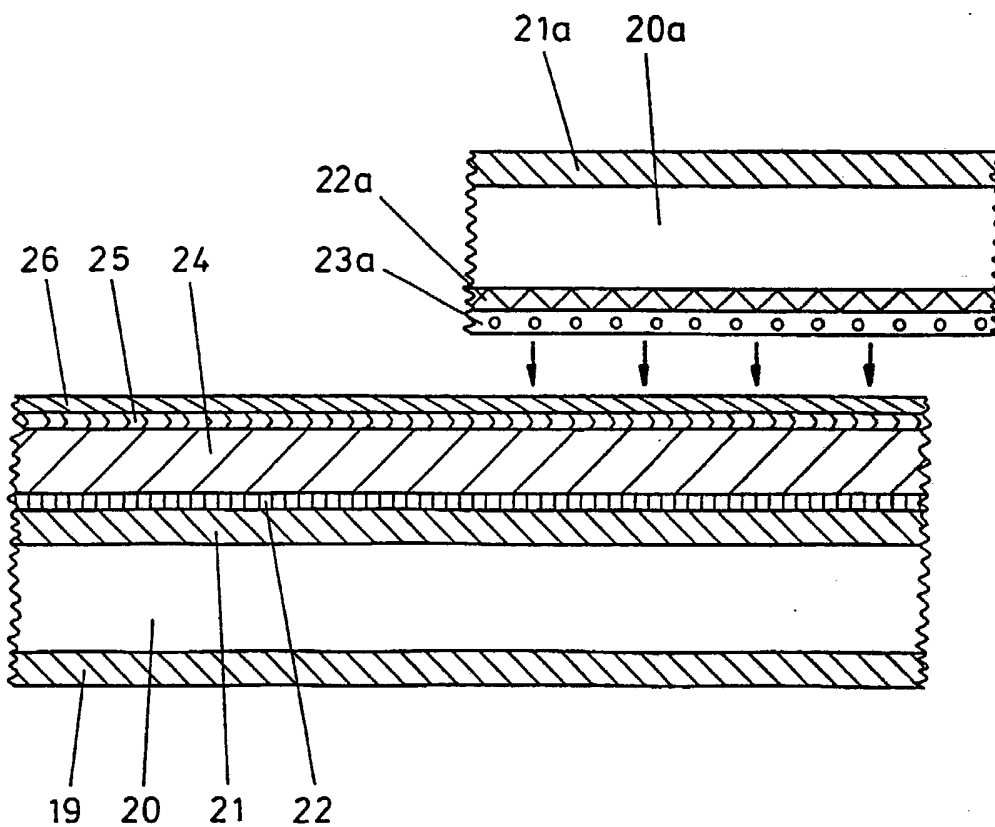


FIG. 2

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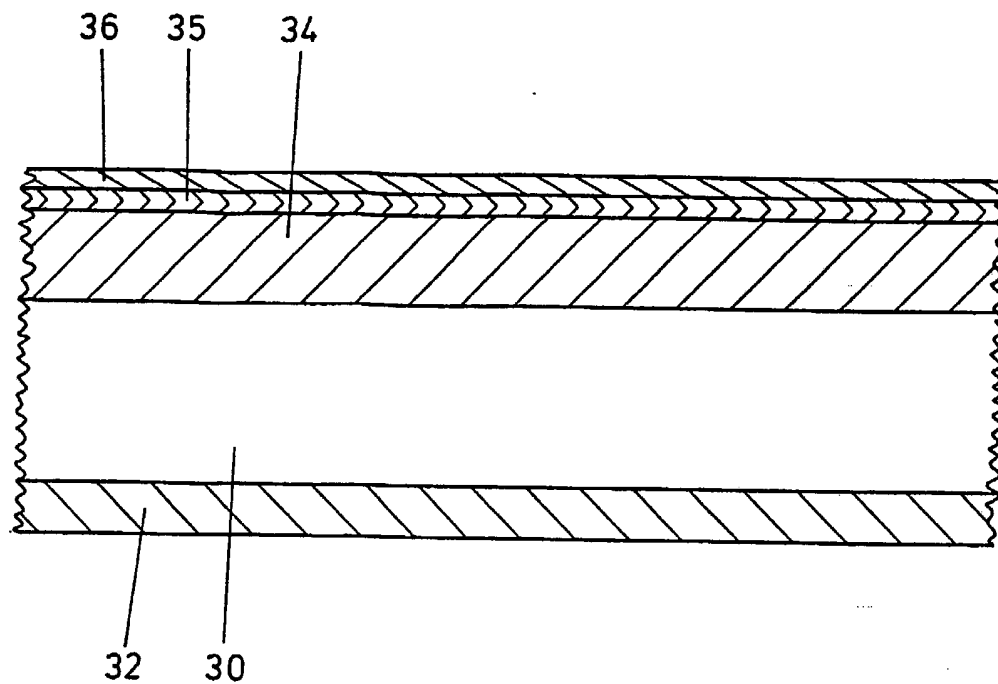


FIG. 3

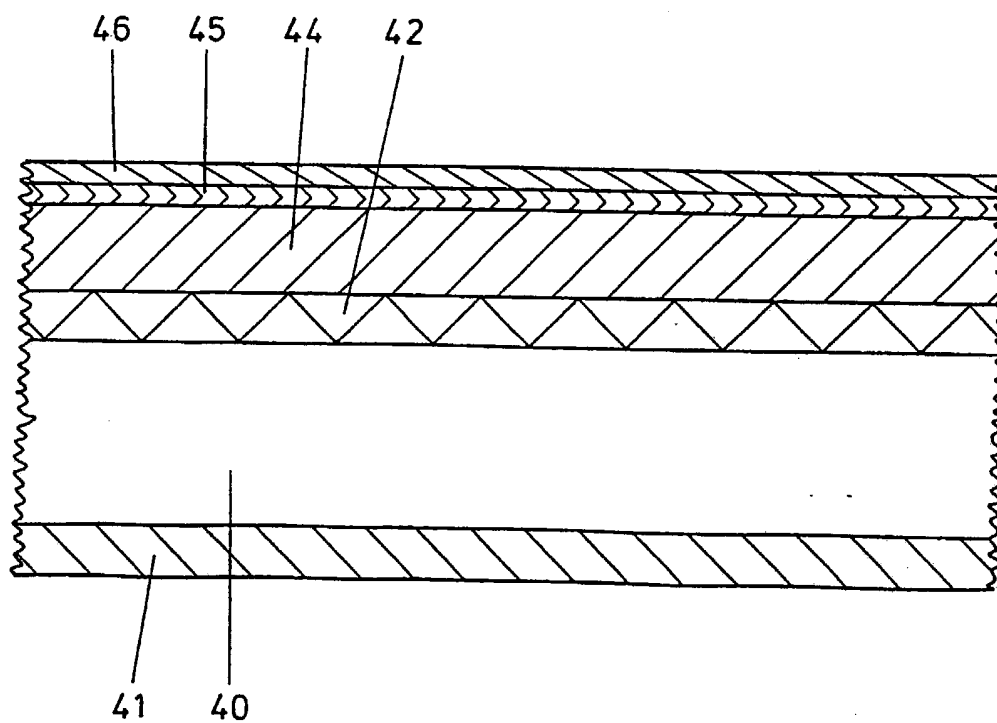


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 92/01919

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 B65D75/00; G03H1/02; B44C1/24; B65D65/42

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System	Classification Symbols
Int.Cl. 5	G03H ; B65D ; B44C

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE,A,4 025 296 (DAI NIPPON INSATSU K. K.) 14 February 1991 see page 2, line 45 - page 3, line 18 see page 9, line 34 - page 11, line 5 ---	1,6-10
X	EP,A,0 338 378 (AMERICAN BANK NOTE HOLOGRAPHICS, INC.) 25 October 1989 see column 1, line 45 - column 4, line 3 ---	1,6-9
X	WO,A,8 903 760 (DENNISON MANUFACTURING COMPANY) 5 May 1989 see page 4, paragraph 1 - page 9, paragraph 3; examples 1,2 ---	1-3,8
X	EP,A,0 365 031 (TOPPAN PRINTING CO. LTD.) 25 April 1990 see page 2, line 1 - page 5, line 11 ---	1,2,10
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⁹ Special categories of cited documents : ¹⁰^{"A"} document defining the general state of the art which is not
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cannot be considered to involve an inventive step when the
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ments, such combination being obvious to a person skilled
in the art.^{"A"} document member of the same patent family**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

17 MARCH 1993

Date of Mailing of this International Search Report

02.04.93

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

DOOLAN G.J.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category "	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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17/03/95

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